REMARKS

Claims 1-7 were examined. All claims were rejected. In response to the above-identified Office Action, Applicants do not amend any claims, cancel any claims, or add any new claims. Reconsideration of the rejected claims in light of the following remarks is requested.

I. Differences From the Cited References

The present invention relates to a high speed optical signal processor including a saturable absorber and a gain-clamped optical amplifier, which has satisfactory characteristics *even when an optical signal is a high-rate pulse or a pulse having a narrow width.*

The first cited reference, U.S. Patent No. 6,356,693 issued to Shimizu *et al.* ("*Shimizu*"), teaches a Q-switched semiconductor laser. However, *Shimizu*'s laser is *not applicable to a high bit-rate optical signal. Shimizu*'s laser cannot compress the pulse width when the input optical signal has a high bit rate. The second pulse cannot be absorbed by the saturable absorber and passes *Shimizu*'s laser, since the recovery time of *Shimizu*'s saturable absorber is long and its absorption coefficient cannot recover sufficiently in a short time. To compress the pulse width of the entire input optical signal by using the *Shimizu*'s laser, the period of the signal must be longer than the recovery time of *Shimizu*'s saturable absorber. Therefore, *Shimizu*'s laser cannot be used with a high-bit-rate optical signal.

In addition, although the pulse ejected by *Shimizu*'s laser is injected into the saturable absorber, it does not cause shortening of the recovery time. Recovery time shortening of the saturable absorber is due to the injection of a *continuous wave*, not a pulse signal.

As to the second cited reference, U.S. Patent No. 5,317,448 issued to Nobuhara ("*Nobuhara*"), the amplifier disclosed therein does not include means for eliminating noise in high-bit-rate optical transmission.

Therefore, the technical features of the present invention are quite different from those cited references. Applicants hope that this background information will assist the Examiner in evaluating the following specific arguments.

II. Claims Rejected Under 35 U.S.C. § 103(a)

The Examiner rejected claims 1-3 and 5-7 under 35 U.S.C. § 103(a) as unpatentable over *Shimizu* (*supra*) in view of *Nobuhara* (*supra*). For the reasons discussed below, Applicants believe that the cited references fail to teach all the elements of the rejected claims, and furthermore that there is no motivation to combine the references.

As to claim 1, that claim recites an optical signal processor comprising a saturable absorber area and a gain-clamped optical amplifier area formed on one face of a substrate. The gain-clamped optical amplifier includes a diffraction grating for generating a laser beam. *Shimizu* teaches an optical pulse compression waveguide including many – but not all – of the structures of claim 1, but *Shimizu*'s structures are arranged differently, operate differently, and achieve a different purpose. *Shimizu*'s device consists of a sequence of interleaved pairs of saturable absorbers and saturable gain regions, which together narrow and amplify an optical pulse. (*See Shimizu* col. 7, lines 5-24.) *Shimizu*'s gain regions have no diffraction grating because they need not generate a laser beam in order to operate. *Shimizu*'s figure 7 shows a Q-switched semiconductor laser (11) integrated with the pulse compressing waveguide structure, but the diffraction grating (13) associated with that laser is not in a gain-clamped optical amplifier area. More importantly, *Shimizu*'s laser is used to generate a pulse, which is then compressed as it passes through the waveguide. Applicants' diffraction grating, included in a gain-clamped optical amplifier area, generates a laser beam that is inputted into the saturable absorber to reduce the recovery time of the saturable absorber (*see* Specification, p. 8, line 23 through p. 9, line 3).

The supplemental reference, *Nobuhara*, teaches an optical amplifier including a diffraction grating in an amplifier part of the structure (an arrangement similar to part of Applicants' device), but there is no reason to combine the *Shimizu*'s and *Nobuhara*'s structures, and several reasons *not* to.

The Examiner proposes "the purpose of providing a laser beam to be amplified" as a motivation to include *Nobuhara*'s diffraction grating in *Shimizu*'s saturable gain regions, as claim 1 requires. However, as previously mentioned, *Shimizu*'s gain regions do not need to *generate* a laser beam. *Shimizu*'s compressor *modifies* an input optical pulse, which may come from a Q-switched laser formed near the compressor on the same substrate, as shown in Fig. 7. In fact, *Shimizu*'s operational principle relies on the

fact that the saturable regions temporarily stop absorption once they have absorbed a fixed amount of optical energy (*see* col. 6, lines 9-12). This corresponds to the drop in the absorption coefficient depicted at approximately t=30ps in Applicants' figures 4 and 5. *Shimizu* relies on the slower recovery characteristic as shown in fig. 4 to accomplish its pulse-shaping purposes, while Applicants' noise-reduction purposes require the faster recovery shown in fig. 5. As Applicants explain at p. 8, line 23 through p. 9, line 9, inputting light of intensity less than the transparent input power of the saturable absorber *reduces* the recovery time of the absorber. Thus, adding a diffraction grating according to *Nobuhara* to generate a laser beam in *Shimizu*'s gain regions would *degrade* the performance of *Shimizu*'s device.

From another perspective, *Nobuhara*'s amplifier is intended to *minimize* the distortion of optical signals (*see, e.g.*, col. 1, lines 5-9), while *Shimizu*'s compressor is intended specifically to distort a signal (by narrowing or compressing it in the time domain). One would not expect to improve a device intended to alter a signal by incorporating a device intended to preserve the signal without distortion.

For at least these reasons, Applicants respectfully submit that claim 1 is not obvious over *Shimizu* in view of *Nobuhara*, and request that the Examiner withdraw this rejection of the claim.

As to claims 2, 3, and 5-7, those claims depend directly or indirectly upon claim 1, and are patentable for at least the reasons discussed in support of their base claim. The Examiner is requested to withdraw these rejections as well.

The Examiner rejected claim 4 as unpatentable over *Shimizu* and *Nobuhara*, and further in view of U.S. Patent No. 5,754,714 issued to Suzuki *et al.* ("*Suzuki*"). *Suzuki* is relied upon only for its teaching of applying an anti-reflection film to faces of a laser amplifier, and Applicants have been unable to locate other material therein that would supply the deficiencies of *Shimizu* and *Nobuhara* with respect to claim 4's base claim, claim 1. Thus, even assuming for the sake of argument that *Suzuki* teaches shielding the facets of the saturable absorber area and the gain-clamped optical amplifier area with an anti-reflection film, it appears that claim 4 is allowable at least for the reasons discussed above in support of claim 1. Applicants request that the rejection of claim 4 be withdrawn also.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely claims 1-7, patentably define the subject invention over the prior art of record, and are in condition for allowance and such action is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800.

Dated: 2/15, 2005

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

Eric S. Hyman, Reg. No. 30,193

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025

(310) 207-3800

CERTIFICATE OF MAILING

I hereby certify that the correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Lillian E. Rodriguez — February 15, 2005